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OSCILLATIONS AND NUTATIONS OF PHILOLOGICAL STUDIES.

BY PROFESSOR BASIL L. GILDERSLEEVE.

(Address delivered at the Philological Congress, Philadelphia, Pa., December 27, 1900.)

This second meeting of the various philological associations of America and their affiliated societies is a memorable occasion. Fitly assembled in the birthplace of our national life, we stand on the boundary line of two centuries and our eyes are tempted to look before and after, to survey the past of the schools of philological research that have dominated the period that draws to its close and to forecast the future that the coming age holds in its bosom. At other meetings the specialist might be excused for treating his audience to a technical paper that would have scant interest for nine-tenths of his hearers, all the better perhaps if he alone appreciated the height and breadth and depth of his subject and left the auditors nothing but the length for their share. But this hour of general assembly is not the time for the syntactician to talk of the handicaps of the various Greek prepositions in the race of life, to draw diagrams illustrating the tensile strength of the cases, or to unroll the spectrum of the moods in the various heavenly bodies that gem the firmament of Greek literature. In fact, I venture to doubt whether even so vast a subject as 'Grammatical Gender,' on which Brugmann discoursed at Princeton, would meet the demands of the occasion, or the interesting topic which Osthoff lately made the theme of an academic discourse, the 'Suppletivwesen der indogermanischen Sprachen.' A wider subject is imperative for the wider audience, and when I thought over the whole range of philological activity that I have watched and that I have shared, I could not suppress the wish that the great master had been spared for this occasion, the eminent scholar and thinker whose eulogies were the dominant theme of our meeting six years ago. In the clear, white light of Whitney's penetrating intellect the cycles and epicycles of philological study would have found their true relation, their true astronomical expression, and the picture would have been bitten into our minds by the etching needle of his mordant genius. But Whitney has left no successor, and indeed, so far had he risen even in his lifetime, that we, his close contemporaries, hardly considered him as one of us, and I cannot trust myself to remember that he was a fellow-student of mine in Berlin half a century ago. It would be vain then to attempt a sketch in Whitney's manner of the changes that the last fifty years have brought about, and you must put up with something far narrower, far more personal, far less scientific, when, in my character of available survivor, I review the story of the last half-century. For it is fifty years since I inscribed my name on the album of the Frederick William University at Berlin, and as a man who has been contemporary with all the Presidents since Jackson does not need a technical memory to recall the succession of our rulers, so I shall not have recourse to the books for a record of the changes with which I have come into personal contact.

The dominant figure of the beginning was the imperial Boeckh, the most prominent figure of the close is the imperious Wilamowitz-Moellendorff. Bopp in 1850, Brugmann in 1900. The Pelasgians prevail at the farther end, the Mycenæans at the nearer. How much lies between two such extremes. What a long list of achievements, what a long list of failures. True, there are failures and failures and sometimes a defeat is better than a victory because it may lead to higher victories, but the retrospect reveals many abandoned positions, which it was idiocy to have occupied and many a shameful rout of the human intellect. In optimistic moods we cheat ourselves with all manner of figures. We talk of the tide that advances though each wave seems to retreat. We speak of progress by spirals along an ascending line. And yet in soberer moments the ocean disappears and nothing remains but the Dead Sea and its gibbering apes; and the famous spiral refuses to act as a corkscrew to unstop the divine bottle, the 'Dive Bouteille,' in which the truth is sealed. But it would be a poor return for the compliment your committee of arrangements has paid me to spend this hour in gibes at the lapses and blunders of my fellow-workers—scholars are too prone, as it is, to criticism of this sort—and I hope there will be no touch of ill-nature in what I shall have to say about the Oscillations and Nutations of Philological Studies from the middle of the century to the present day. For this is my theme, or rather this is the title which in response to Professor Gudeman's telegram I gave to the expectant messenger boy. Oscillations and nutations I wrote—half dreading, half hoping that it would turn into ossifications and mutilations before it reached Philadelphia. The telegram was followed by a letter in which I gave the correct title, but the printer's devil, who has followed me with relentless hatred from my youth up, has changed nutations into mutations and my allusion to the precession of the equinoxes has been rudely effaced. I am not willing to believe the malicious suggestion that conservative Philadelphia has not yet heard of the precession of the equinoxes, but still I will allow myself a quotation from the Encyclopædia. 'The force which produces the precession of the equinoxes,' says my popular authority, 'takes place in a series of small cycloids, and this inequality of motion is called nutation'—and my title has some applicability after all to the history of philology. To trace all these oscillations and these nutations would be impossible in the time allotted to me, and I can only hope to give a few specimens of the ups and downs, the tos and fros, of which I have felt the lurch and carried away the bruises.

From this frank statement you will at once understand that my illustrations will be drawn largely from the line of my personal studies, and yet I am confident that the representatives of the other sections will be able to supply parallels from their own experience and that the fortunes of classical philology will not be wholly a matter of indifference to those whose work has been determined to such an extent by the example of the elder sister, not to say the mother, of philological science. And I am sure that the archæologists would sooner hear the confessions of a philologian than listen to an attempt, however well meant, to show the oneness of archæology and philology.

Gottfried Hermann died in 1848—a convenient date for which every student must be thankful, inasmuch as we always feel an especial gratitude for such coincidences, gratitude to Chaucer for having died in 1400, to Dryden for his decease in 1700, to Cowper for his demise in 1800. 1848 was a year of revolution and it was time for the hero of the old school to depart. He had fought his fight and Boeckh was the undisputed master of the situation. In 1850 Boeckh was what some of you would call an old man. He was sixty-five and he looked every day of it. There was no spring in his walk, no alertness in his bearing, nothing salient in his personality. I can see him to-day as I saw him fifty years ago—nursing his leg as he sat and dealt out his wisdom from the yellow *heft* to which he turned from time to time by way of refreshing his memory for a date or a point. He was the first great scholar I had ever seen in the flesh and though there was nothing about him to fire boyish enthusiasm, still it is to him that many of us owed whether for good or for evil the impress that determined our lives. The flush, the tingle was to come afterwards, when Ritschl's burning spirit kindled an answering glow, but it was Boeckh who gave the men of my time the conception of the philologian's vocation. Nothing less would have satisfied some of us than the panorama that he unrolled, the vast orbit he himself had traversed, the lofty structure, the ὑψίγυιον ἄλσος, he himself had builded. In his scheme there was room enough and to spare for every human activity, there was delight enough for every human susceptibility, and many a student mistook his own cry echoing down the vast corridors that were opened to his vision for a true vocation. But what has become of the 'Erkenntniss des Erkannten'? What has become of the 'Spiritual Reconstruction of the Classic Past'? What has become of that ideal of the Science of Antiquity? The name 'Altertumswissenschaft' still flourishes on the cover of manual and encyclopædia, but the advance of specialization has made the scheme an impossibility—nay, as we are apt to say by way of self-excuse, a physical impossibility. There is no Science of Antiquity, there is nothing but a cycle of studies; there is no unity, there is only diversity. We can hope to cover only a small arc of the cycle. The grammarian must renounce archæology. The archæologist cannot undertake to be on a friendly footing with grammar. A vague sympathy, a mere glimpse, that is all we can accord to those that dwell in other spheres of our universe. The proverb that was old in Rabelais' time comes up to our lips: He who embraces too much, hugs but little—'Qui trop embrasse, peu étreint.' The only true enthusiasm lies in specialization, as Ritschl himself said, and the effort to compass the whole realm of knowledge ends in bewilderment and failure. From the intellectual side, yes; and yet among all the oscillations that I shall have to note the most significant is the return of the vanished ideal. But this I reserve for the last and look for the exemplification of my text in the works of my first and greatest master. Years after I left Berlin I took up his 'Encyclopædia and Methodology,' a posthumous work, based on his lectures, and read it not without edification. Who could read it without edification? Who could open it without learning something, or without at least feeling the stir of a new thought? And yet there is one lesson never intended by the author that is to be gained by the study of the illustrations with which Boeckh, or his editor, accompanies his wise canons. These illustrations are drawn largely from his own writings and if any man was ever justified in quoting himself as an example it was Boeckh, and yet how large a proportion of these results and these processes have been thrust aside by later and more exact research; and page after page of his most admirable calculations must be stricken out—'ganz gegenstandlos geworden,' as a recent saucy critic has cruelly put it.

During my semester in Berlin Boeckh interpreted the 'De Corona.' This year marks the completion of Professor Goodwin's monumental edition. 1850 and 1900 shake hands over the foremost orator of the world. No wonder then that the mention of Boeckh calls up the first specimen of oscillation as to the genuineness of the documents incorporated in the Attic orators. In 1850, if I may trust my notes, Boeckh held himself neutral and leaned to neither side in the controversy which had been initiated by Droysen and pushed to an extreme by Westermann. At all events Boeckh's attitude was deplored as too conservative, and Westermann had it all his own way for a while, and I remember with what fine scorn I looked upon the Didot edition of Voemel, in which that behind-the-times scholar had printed all the documents in large type in order to do them especial reverence. And yet the Didot edition is not a bad edition. It contains the fine old Latin translation of Hieronymus Wolf: and more is to be learned from these old Latin translations than from many treatises on style. And then I had found Voemel's little book on Greek synonyms very valuable; and, indeed, only a few years ago Epimetheus Blass stopped the press in order to add an appendix to his edition of Kühner, which he might have written earlier if he had properly studied Prometheus Voemel. So Voemel was not altogether to be despised, and after the usual amount of inveighing against these spurious documents and bracketing them with the handcuffs such impostures deserve, Kirchhoff and Köhler had a word to say on the subject and the whole philological world swept in the opposite direction as you may read in Engelbert Drerup's essay on the subject in the 24th supplement of the Jahrbücher. Engelbert, whom I knew as Geheimrath Lipsius' famulus in the Peloponnesus four years ago, has something of the judicial poise and the whole matter is once more under review. It is as pretty a specimen of oscillation, or, if you choose, nutation, as one can find in the annals of classical philology and the arc is nearly the arc of my life.

It was said of Boeckh that he was one of the few men who could read Greek so as to bring out both accent and quantity. The same thing has been said of a good many other men and all that I can recall distinctly about his pronunciation was his ineffectual struggle with the hard dental and the soft dental of the German tongue, and I shall never forget the solemn emphasis with which he said what sounded to me like 'In der Dad.' But he was undoubtedly fond of spouting Greek and he would read aloud to us long passages of the 'De Corona' and illustrate them by gestures prescribed by the ancients. Doubtless, the Greek pronunciation was every thing that it should have been according to the best German standard of the time, but the story current about his rendering of the Greek accents recalls one of the most remarkable oscillations, nutations, whirligigs of the period under review. The accent in ancient Greek was a pitch accent, if we may trust the evidence of the nomenclature, if we may trust the evidence of the inscriptions, in which the musical notes as a rule rise and fall with the accent. Modern Greek accent is frankly a stress accent. Now, volumes have been written on the combination of pitch and stress, on the transmutation of pitch into stress. But the sad problem faces us 'What are we to do? Sing the accents or stress them?' There is said to be a village on Chios, where the whole thing is made plain by the native pronunciation, but in default of such demonstration the practice is, to say the least, lacking in consistency. To the modern Greek the accent means something; at least the acute does. But to too many English scholars the accents are so many meaningless ornaments whether for pitch or stress, and Chandler, in his second edition, shows his abhorrence of what he calls the insipid subject—as insipid, let us say, as the white of an egg. But Job who asked the question: Is there any taste in the white of an egg? might have been surprised to learn what the white of the egg is to the chick, and Chandler's contempt of the insipid subject might have been modified by further study. Still, with such views it was not to be wondered at that there was at one time a widespread revolt against the Greek accents and all the labor they entailed. When I first read Justin Martyr—that unwashen Christian to whom I was chained by my friend Professor March for two years—the only accessible copy in the library of the University of Virginia was a Würzburg edition of the last century (1777) without an accent to its text; and the Englishman whom Jefferson imported to teach his Oxford Greek rebelled against the signs that signified nothing to him. What dreadful radicalism not to preserve the precious tradition, even if it cannot be actualized, said I to myself in my youthful fervour forty-four years ago when I undertook to set up the fallen idols of acute, grave, and circumflex. How I groaned over the shortsightedness of Long and the obstinacy of his colleague Key in these iconoclastic proceedings. But I smile sadly over my righteous indignation at the evil ensample set by the said Long and Key. Long and Key when they returned to England were forced by the pressure of the scholarly world to conform to the old usage—but hark! there comes across the seas the news that the redoubtable Wilamowitz-Moellendorff has joined the ranks of those who even in our day are about to throw overboard what the old grammarians called the *anima vocis* in order to save what is left of Greek to modern culture. More oscillation, more nutation, more whirligig.

The most striking thing to the student of Greek lyric in the *editio princeps* of the resurrected Bakchylides, was the resemblance to the old Heyne-Hermann Pindar which had been superseded by Boeckh, the return of the short, jerky *kola* instead of the long sweeping lines which the great master of metrical science had established. The editor had followed the MS., as a matter of course, and there was no attempt to rearrange the verses after any modern system. But the coincidence, though easily explicable, was a startling reminder of another whirligig, another nutation, another oscillation. The author of the metres of Pindar was supreme at the time when my apprenticeship began, and as I sat in the seat of the adoring disciple I recalled with amusement the astonishment which Boeckh excited by his 'Metra Pindari' in the minds of the old scholars who edited the 'Collectanea Græca Majora,' a manual still used at Princeton in my boyhood. To be sure, when we passed out of the range of the familiar metres there was trouble without end for the novice. Boeckh might scan Pindar for us, but what was to be done for the choruses of the tragic poets, the choruses of Aristophanes. Luckily, the puzzled student could appeal to a *Magnus Apollo* in the person of Wilhelm Dindorf, whose handbook of metres was treated exactly as if it were a table of logarithms from which there was no appeal. It was a very blind proceeding, but whatever we may have thought in our hearts of the jumble of ithyphallics, choriambi and antispasts, we copied the schemes and tried to read the verses in accordance therewith. Then arose Westphal, then came J. H. H. Schmidt and all was light. Old Lehrs to whom Schmidt dedicated his book was justified of his intellectual children. The new metric, the new rhythmic was greeted with loud acclaim; and up went the shout—'Liberty, Equality, Fraternity!'—Liberty from Tradition, Equality of the Bars, Fraternity of the Feet—but the greatest of these was Equality of the Bars. It is hard for any one addicted to this bar business, as we all know, to give up the habit, and the generation which found its solace in this system will find it hard to adjust itself to any other. But that does not mean that we are to shut our eyes or stop our ears. Years ago one might have forefelt what was coming and some of us had to whistle our aforesaid bars to keep our courage up. It was with an uneasy feeling that we noted the care with which the old metricians were resuscitated and no Westphalian or Schmidtian ought to be surprised to have the choriambi cantering over his head once more, to hear the triple watchdog growl of the molossus, or to see the banished antispast come back, the two long arms waving triumphant flippers at either end. Chaos, metrical chaos, is come again, as has been openly proclaimed and repeatedly echoed. Chaos is come again. No! No! 'When I love thee not, chaos is come again.' And love abideth even amid the confusion worse confounded of science.

This special oscillation has prostrated many of us Greek scholars with deathly seasickness, and seasickness is apt to suspend all human sympathies. But we are not so immersed in our own troubles as not to note the oscillation that is going forward in other parts of the philological boat, as not to note the perpetual motion of the Saturnian, as not to note the 'Hebung und Senkung,' the 'Senkung und Hebung' of Germanic metres and the ups and downs of English metricians, Guest in one decennium and Schipper in another. It is metre and no end, *μέτρον ἄμετρον*, all over the face of the philological deep.

And so I might continue to follow line after line of the various researches initiated or pursued by the great scholar whose effigy looks down on me every night in my study, whose Solonian motto cheers me along the homestretch. It was in him that I saw that motto exemplified, that *γηράσκω αἰεὶ πολλὰ διδασκόμενος*, that most comforting viaticum of every aging scholar. But I am afraid that I may be misunderstood, if I should go into too many details. In one of Lucian's most vivid, most drastic sketches there is a description of a banquet which ends in a Donnybrook Fair, and while the rival philosophers maul and pummel each other, Ion, the Platonic, holds himself aloof and joins neither party. Such a superior bearing is simply odious, and it is a pleasure to know that, despite his admirable poise, Ion was himself bespattered by the spilth. Now there has been no *suave mari magno* in my attitude. I have fought and fadded with the rest. I have oscillated and nutated with my fellows even down to the present day, and the ups and downs of the Greek stage to which I have been subjected of late would have made a less hardy mariner ill. I have been under the spell of all the captains of philological thought. I believed in Boeckh. I swore by Ritschl, and though I yearned to be a Sanskritist I could not be a Sanskritist without violating one of Ritschl's ten commandments; and so I merely looked over the garden wall and studied Benfey's 'Wurzellexicon' in which figured a certain indigestible and unpronounceable radical, Θϝρι, which seemed to be the mysterious source of nearly all the Greek vocabulary. When Curtius piloted the way into new waters, I left the land for the sea with the true Greek facility, which made a man a shepherd at one season and a pirate at another, and I followed his lead in my little shallop. It was disillusioning, I admit, to be told by the master himself that in edition after edition of his Greek Grammar he had been crying 'Compensation! Compensation!' when there was no compensation;[1] and I was shocked beyond measure to find that in discussing the decay of the diphthong *αι* he confounded two such familiar characters in the 'Clouds' as Pheidippides and Strepsiades.[2] Still I held to the man who bridged the chasm between Hellenist and Sanskritist, and I came near accepting George's doctrine of stratification as I had years before accepted Ernst's Ionians before the Ionian migration. Nor have I ceased to be grateful to him, now that he is gone, and I felt the deepest sympathy with him when I saw him for the first and last time towards the close of his useful and honored life. 'The archers had sorely grieved him, and shot at him and hated him.' And yet who could withstand the slings and arrows of the 'Junggrammatiker'? But the 'Junggrammatiker' were young and now are old, and though I shall not live to see them come to grief in their turn, still there is a saving clause in their strict science that may turn out a damning clause in the end; and some of their own prophets say that analogy will land them on the rocks of ancient etymologies once ridiculed as monstrous absurdities.

To this scientific treatment an exact system of phonetics is indispensable, and the steady evolution of phonetic science is worthy of all admiration, an admiration that is not in the least qualified by the fact that so many phonetists are utterly lacking in the mimetic faculty. Their trouble is only akin to that which visits almost all those who deal with the grammatical refinements of a language and which dooms nearly every specialist in grammar to an intolerable style. But to the specialist in phonetics that is a mere matter of detail and no one is shocked when the mysteries of English and German and French phonetics are expounded in what laymen choose to call a deplorable foreign accent. Now the study of phonetics is naught without the mastery of the physiology of sound. To follow, for instance, the path of the *r*-sound is as thrilling to the lover of language as a voyage in the track of Odysseus from the throat of the Cyclops to the lips of Penelope; and now that the phonograph has begun to play its beneficent, albeit squeaky, rôle, we shall leave for our successors cylinders as fascinating as those that the Babylonians have left us to decipher. To be sure, oscillation and nutation are not lacking here, and the whole subject is a boon to one who believes that War—not so much Strife as Organized War—is the Father of All Things; and whenever matters wax dull in a philological gathering, call on Metre, and if Metre gives no response call on Phonetic and that nymph, the successor of Echo of old, will not fail to evoke the liveliest discussion. True, there is a practical side to phonetics that is not so pleasant, and here again I must beg pardon for bringing in a personal experience. To judge by some essays on the subject, the early stonecutters possessed an admirable phonetic alphabet from which we can restore the pronunciation of the dead centuries, but modern scholars have not the same advantage, and in the extremely valuable and interesting articles that constitute so large a part of the journal with which I am chiefly concerned, the standard Roman alphabet is forced to undergo a great variety of changes. A bodkin is run through the neck of one letter, a dagger is thrust through the vitals of another, a plume adorns the head of a third, a demilune is attached to the foot of a fourth. There seems to be no end of such contrivances, and when one thinks that one has exhausted all possible configurations and has characters enough for every possible emergency the heartless printer brings in a swingeing bill for 'arbitrary accents,' for this is the unscientific fashion in which the successor of Aldus designates these indispensable instruments of modern research.

Fortunately, some one will say, fortunately for the finances of the American Journal of Philology there is no such heavy tariff for decimal figures, and statistics are not so expensive as phonetics. I accept the congratulation with all that it implies and cheerfully bear my share in whatever opprobrium attaches to the statistical mania, which has had its full swing for the last twenty-five or thirty years. Of course, statistics have always been used more or less. But stichometry, or the counting of standard lines in a MS., was a mere matter of business, and the Masoretic enumeration of verses was a precaution against the corruption of the sacred text. No statistical use was made of the large collections of glosses, and though sporadic observations of a statistical character are found here and there in old commentaries, yet the use of statistics as an organon of philological research falls within my time. In the domain with which I am especially concerned the example was set by Lange in a remarkable paper read by him before the Philological Congress in 1852, and from Lange to Lutoslawski, the latest and most formidable statistician, there has been no lack of protest all along the line. Friederich Vischer indited a very effective lampoon against it, Spengel held the whole movement in contempt. Zeller marshals a formidable array of difficulties that bar the way to any trustworthy results. A well-known scholar cries out that a statistic of thought is a monstrous delusion, and in his recent edition of Pindar, Schroeder sets up a sign: *Cave furorem arithmeticum.* As I have done a little work in that line myself and have directed a good deal more, it may reasonably be expected that I should do battle for the sacred cause of decimal fractions to the last ditch or rather to the last place, but I too am ready to concede that, unless carefully guarded, the practice may degenerate into a mere heaping up of inorganic facts. There is an order of intellect that is not accessible to anything but figures, and to such gentry figures are the pillar and ground of the truth, whereas they are often nothing but a refuge of lies. But after the organic truth has been acquired either by observation or by sympathy, there is an undeniable pleasure in giving exact expression to the phenomena—arithmetical expression, if you choose. But the empty jar method of statistics, the swept and garnished method of statistics, the prayer for rain, the prayer for a demoniacal possession—that is a *furor arithmeticus* with which I have never had any sympathy, in spite of all the fads to which I have lent an ear in my time.

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[1] See my *Essays and Studies*, p. 81.

[2] Curtius, *Studien* I, 2, 273, followed blindly by Meyer, *Gr. Gr.*,^{2} 125.

That the statistical method of syntax is doomed I am quite ready to believe, for the development of psychological syntax bids defiance to mechanical counting, that psychological syntax which was started by Apollonius the Crabbed more than seventeen hundred years ago and which is destined to a swing that corresponds with the centuries. The frame of mind, the mental pulse, the state of digestion, the feeling that comes over one after a French *apéritif*, after an American cocktail, that feeling which suggests a stimulative subjunctive to match the stipulative subjunctive, of which we shall hear something during the session of this congress, the balancing between will and desire, the poor cat in the adage attitude—all these subtle shades are subjective states that require a finer calculus than we have thus far at our disposal, and yet they all have their ample justification in the nature of things. Why should not the Greek and the Roman have as many moods as the Turk, and if these ancient languages fail to note by distinct forms all these various phases of emotion, why can we not supply them? There is a French grammar of the old type that gives eighty different meanings to the interjection *oh*, and why cannot we subdivide the moods after the fashion of the Turkish language, to begin with? True, the internal structure of the Greek mind, the Roman mind, may have been more simple than ours, just as the carnivora have a shorter intestinal tract than the herbivora; but that is a mere matter of detail, like everything else that interferes with our pet theories. However, I forbear to forecast the reach of psychological syntax and the date of its backward swing. For I find that I have not left myself time to speak of matters of even greater general interest, such as the re-installation of Homer, pen in hand, such as the return of the ox and the camel to the head of the Greek alphabet, such as the resurrection of Romulus recently proclaimed by Italian scholars. As to the individual oscillations and nutations—or shall I say vacillations and titubations—I have renounced in advance any attempt to record these melancholy evidences of rash generalizations and precipitate inductions. Every new edition of philological manuals would furnish specimens that do not lack human interest, but I am nearing the moment when my personal pendulum must lessen its arc and come to a standstill.

The mocking Samosatan, whom I have already cited in this discourse, has left us a famous tractate on the True Method of Writing History, the greater part of which is taken up with the exemplifications of the different ways in which history is not to be written. Of the constructive side he has little to say, and I am afraid that I have followed his example too closely. But I am content to leave to others the pleasing theme of the positive progress of philological science during the last fifty years—despite the vagaries, despite the blunders, despite the oscillations, the nutations and the whirligigs, and to a great extent because of them. That advance has indeed been prodigious, especially in the last quarter of a century; and European scholars, even the most bigoted of them, find that they have to count with a new factor and have to recognize in our philological work a national stamp. As an American I am proud of what we have done, but there is no danger that the purely scientific side of our work will suffer, and if I have recalled perhaps in too audacious fashion some of the abandoned idols, some of the forsaken fads of our science, it is because I wish to emphasize in closing the danger lest we forget that philology is not all a science, that it is an art as well. Shall I make bold to say: The things of science are temporal, the things of art are eternal? Doubtless many of you would reverse that saying, but it is to the conviction that philology is not all science, it is to the quest of art through science that I owe the joy of life in my vocation. A philosopher has been called a *poëte manqué*—and perhaps you will say that a philologian of the type that I would set up might in like manner be defined as a *littérateur manqué*. It is better to be a plodding man of science than a mouthing and phrasing rhetorician; and we have every right to show impatience with literary *bric-à-brac* in our calling, and to insist on technical training for the critic of Plato and the eulogist of Demosthenes. One feels more confidence in Lord Brougham's glowing appreciation of the great orator when one finds that he thrilled to the particle γε in the speech on the Chersonesus just as Moritz Haupt thrilled to the particle γε in the Iliad; and the flippant affectation of familiarity with high literature, not based on accurate knowledge, is to the true scholar a counterpart of Jenkins's paraded intimacy with dukes and duchesses. There are alembicated stylists in vogue who are quite as hateful to those who truly love and truly know as the most horny-eyed dullard who deals with dead facts. We are all on the side of exact, of exhaustive knowledge. But there is danger for us all in the divorce of our science from the art in which it arose and from which it still has so much to gain. Time was when the scholar, as a rule, paid strict attention to the form as well as to the contents of his message. Now slovenly English, English that is infected with German words and German idioms, is the rule rather than the exception in papers that deal with every aspect of philological study, even the most spiritual; and in order to get back to the realm of clearness and sane expression there are those who cry aloud for the lost Latin of our grandfathers and the cry is reinforced by those who despair of mastering the tongues of the Parthians, Medes, and Elamites, and all the outlying peoples that publish Journals of Philology. We cannot afford to neglect the regulative side of grammar and to make the name of philologian a reproach, if not a hissing, in the realms of literature. Something, nay much, is to be said in favor of the sedulous imitation of the authors whom we undertake to teach, and as I have already intimated, the old translators can give us important hints in this regard. Robert Louis Stevenson, as is well known, learned to handle the instrument which he mastered so thoroughly by the close imitation of different models of English composition, and his essay on style shows how he rediscovered the laws of ancient rhetoric. Synthesis leads to analysis as well as analysis to synthesis, perhaps more readily; and from the purely scientific point of view the practice of composition is far from being fruitless, and stylists may be the saviours of grammar as architects have been the saviours of archæology.

Old Mitscherlich (1760–1854) was still living in Petersilienstrasse in Göttingen when I was a student at the Georgia Augusta. He was still a member of the faculty and had to be waited on in dress suit and white gloves by the unlucky candidates of philology. When my time came he had ceased to receive visits, but one of my older comrades gained access to the veteran, who asked him whether the boys were still diligent in working at their Latin verses. It seemed, even in the middle of the century, a strangely old-fashioned question to ask, for Latin versification was going out then as Latin prose composition is going out now; but when we recall the fact that the man who led the way to some of the greatest achievements in Latin philology was an accomplished *versifex* and triumphed over the supercilious Madvig by the exactness of his knowledge gained in that exercise, some of us have reason to be ashamed of our gibes at the art and we must try to rejoice in the specimens of the Batavian Muse that the competition for the Hoeufft prize brings out every year. Our age is supposed to be too busy for such trifling, but unless I am mistaken there are signs of a return to the *operosa carmina* in which all scholars practised themselves in the bygone centuries. At least the decree of Wilamowitz-Moellendorff has gone forth and there is nothing left for us oldsters, who have not stirred up the gift that is in us, except to plunge into the hiatus of one of Wilamowitz's own early pentameters. It is wide enough and deep enough, if I remember aright, to swallow up any devoted Curtius, hobby-horse and all.

Perhaps with the return of art there will come the return of the vanished ideal. The rough rider of classical philology to whom I have referred so often in this discourse and who has had so conspicuous, so brilliant a career, has set an example of the most varied activity under the one banner of philology: and at a time when the study of classical philology seems to be sick unto death in its once favorite abode, Wilamowitz has shown how possible it is to rouse a wide interest in a languid public; and the alumnus of Schulpforte, whose last volume, hot from the press, is dedicated to his old teachers, has demonstrated that the cause only needs courage and genius—though that 'only' means everything. There are signs of a coming time when we shall after all win our way back from diversity to unity, when every specialist shall work at his task in conscious relation with the whole—not merely with the cycle but with the sphere itself. That is an oscillation, that is a return which some eyes have waited long to see.

A pupil of Boeckh, I have been borne on with the current of the times. I began as a literary aspirant. I have wound up as a statistical syntactician. But here, as I have an opportunity for free utterance among my fellows, I have a message to deliver. There is a familiar story of a scion of the ancient race who became a prelate in a Christian Church—Catholic, Anglican, Lutheran, I forget which. But when the last hour came, this model of orthodoxy was heard to murmur in the sacred tongue the formula he had learned in his childhood: Hear, O Israel, the Lord our God is one Lord! And so, as I gather up, not my feet into my bed but my papers on my desk, I would reiterate the confession of my faith in the formulae of my youth, my belief in the wider conception of philological work, in the necessity of bringing all our special investigations into relation with the whole body of philological truth, the life of the world, the life of humanity. This said, I have freed my soul, I have delivered my message; and at the next Kalends, like the usurer Alphius in Horace, I shall doubtless hie me back to my decimal tables, my syntactical statistics, the handicaps of the prepositions, the tensile strength of the cases, and the spectrum of the moods.

THE OYSTER REEFS OF NORTH CAROLINA: A GEOLOGICAL AND ECONOMIC STUDY.

By CASWELL GRAVE, Ph. D.,
Bruce Fellow in the Johns Hopkins University.

An Introductory Note by Professor W. K. Brooks.

The paper which follows, gives an account of the instructive study of the oyster reefs of North Carolina which has been carried on by Dr. Caswell Grave, Adam Todd Bruce Fellow in this University, with the coöperation of the U. S. Fish Commission. Dr. Grave describes the way in which oyster reefs, like coral reefs, become gradually converted into islands, and he shows that some of the islands in Newport River still show traces of their foundation of oyster shells, while other reefs exhibit the successive stages through which an oyster reef becomes changed into an island.

He also shows that the history of these reefs gives a scientific basis for the artificial establishment of new oyster beds. Dr. Grave has already made practical application of his scientific results, and he has thus succeeded in founding new oyster beds in spots where all previous attempts had failed.

The body of water which empties into Beaufort Harbor, North Carolina, although known as Newport River, is more like a bay or sound. It is a typical tidal river, however, and in it are found the natural oyster growths which furnish the subject matter of this paper. The river receives enough fresh water from its swampy sources to considerably sweeten it, but its currents are mainly due to tides, which, in the harbor, have a vertical range of from three to five feet. The currents in the main channels at times develop a velocity of something over one mile per hour.

A most conspicuous feature of the river is the oyster reefs which, at any but the time of high tides, can be seen standing out of the water and extending away from the shore. At high tides they are completely covered, and at these times the river presents an appearance of an unbroken sheet of water.

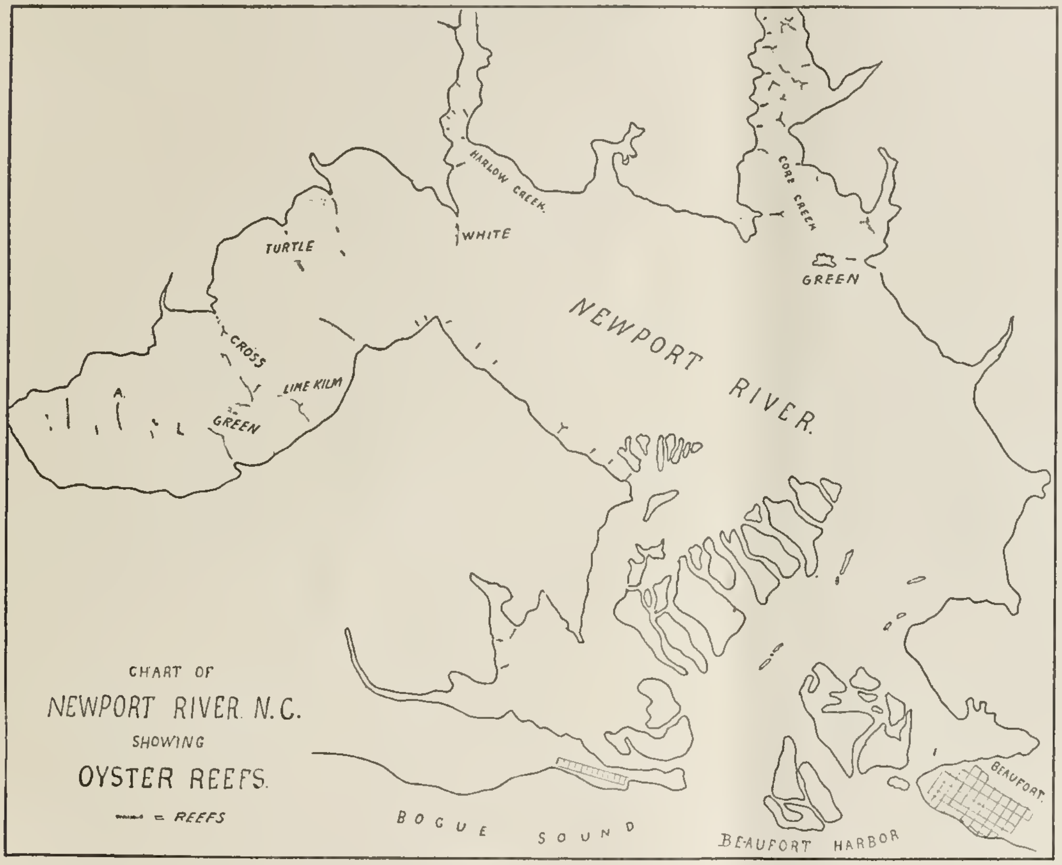
As their name indicates, the reefs are long and narrow in form and are a source of no little inconvenience to the navigation of the river, especially at the time of high water.

While engaged in an investigation of the biological and physical conditions of the North Carolina oyster, I had an excellent opportunity for the study of these natural growths of oysters and as I began to understand their method of formation they grew in interest, for in them we have a secret of a method of artificially growing oysters which has been and must be successful when faithfully adhered to. In them, too, we have an agency which is at work at the present time, slowly but surely, in the production of new islands, and in a manner as interesting as that by which the coral islands are produced.

From an economic standpoint, almost the only useful purpose served by the oysters of a reef is to be found in the supply of spawn which they furnish to the oyster beds located in deeper waters, for reef oysters are little used for food.

The reefs are composed of clusters of oysters, each rooted in a sub-stratum of soft organic mud mixed with shells and shell fragments. The individual oysters of a cluster are long and narrow, and, from their fancied resemblance to the paw of a raccoon, they are known as "coon" oysters. By some, this name is claimed to have been given to them from the fact that, at low tide, the reefs are visited by raccoons for the purpose of devouring the exposed oysters.

A cluster is a peculiar colony which represents from three to seven generations of oysters, all but two to four of which are dead. Each succeeding generation becomes attached to the shells of the preceding and thus the cluster grows wider and higher in a way which may be described by comparing the cluster to a genealogical tree. The oldest or lowest oysters, dying either from being crowded by the oysters above or smothered by the sediment below, leave their empty shells as anchors or supports to the colony. Sediment being deposited between the clusters, the bottom keeps pace with the upward growth of the oysters. The individual oysters of a cluster assume a vertical position; the mouth being uppermost, and due to their crowded condition they become long and narrow.



In passing up or down the river, the reefs appear to lie with their long axes at right angles to the shore line, or as it were to be incomplete dams across the river. A careful study shows, however, that they have been formed not with reference to the shore line, but with reference to the river currents, and their apparent relation to the river bank comes from the fact that, as a rule, the river currents flow parallel to the shore line. When this is not the case, the reefs in that locality are found to lie with their long axes at right angles to the current channel.

The chart of Newport River, which accompanies the paper, shows the number and position of the larger reefs found. The reefs are shown as dotted areas, and above each of the larger ones is placed the name which has been given to it by the oystermen. The reefs are known among the oystermen and fishermen as "Rocks."

In examining into the conditions as they exist in the immediate vicinity of a reef at a time when it is yet uncovered by water, a strong current is found rushing past its outer end; the direction of the flow of which is at right angles to the reef's long axis. A short distance either above or below the reef, very sluggish currents are flowing, either parallel to its long axis or in long curves and eddies. The water which bathes the immediate edges of the reef, is found to have little or no motion. (See Figure 1.)

The effect of these conditions is readily seen:—the oyster and shells at the end of the reef, where the swift current sweeps past, are kept washed clean of sediment; while above and below the reef the conditions are favorable to the deposit and collection of the silt which is ever present in large quantities in the water of the Newport River.

Young oysters at the end of their free swimming life attach themselves to almost any object, whether suitable or unsuitable, which happens to be at hand when the critical attaching stage is reached, but only those which chance to settle on and in places practically free from sediment, survive. The oyster at the time of attachment is so small and delicate, that it is easily smothered. For this reason, of the millions of oysters which attach themselves every season in the Newport River, comparatively few ever come to maturity.

The most favorable places then, on a reef, for the attachment of "spat," are the oysters and shells at the end. The young oysters which attach themselves here, have the most favorable conditions to their life and growth: they are in no danger of being overwhelmed by sediment and their food is carried past their mouths in constant abundance. It is very different, however, with the young oysters which have become attached to the shells at the sides of the reefs; some settle upon shells coated with sediment and perish immediately, others succumb, soon after attachment, to the silt which, unable to be held in suspension by the water when checked in its motion by the reef, is constantly being drizzled upon them and being carried into their gills. Others, while not smothered, finally die because of the insufficient food supply afforded by the sluggish currents.

If at the sides of a reef an adult oyster or a piece of a cluster is broken off, it falls down into the mud and is not only smothered itself, but its shell is so covered by slime as to be of no use as a spat collector. If, on the other hand, the oyster falls from the *end* of the reef, not only are its own chances of life good, but its shell affords a place for the attachment of young oysters a little further out than it had before been possible. Thus it is seen that, while the conditions to the extension of a reef in the direction of its long axis are most favorable, just the opposite is true to its growth in width.

But how did the present existing reefs originate?

Skirting the whole river shores there is even now a more or less continuous fringe of clusters and small young oysters are almost invariably found adhering to such solid objects as have been for some time firmly stranded on the shoals out in the river.

Objects which serve as places of attachment for young oysters, are always present in abundance along the river shores, but out in the river such permanent objects do not commonly exist. A conch shell, for instance, may lie undisturbed on the river bottom for weeks and become covered with spat, but sooner or later currents of unusual strength are developed by winds and the shell with its little oyster colony is swept away or covered up. Although such mid-stream colonies may sometimes persist and become the nuclei from which reefs may originate, their fate is most commonly that just described. From the chart which accompanies the paper it is not difficult to see what reefs have had a mid-stream origin.

With the fringe of oysters along the shore, or the small colonies attached to objects stranded on the shoals, as a foundation, I shall endeavor to show how the reefs might have been produced through the action and reaction of the conditions which have been described.

Because of their nearness to flowing water, those oysters which live on the points on the shore where the river bends, or on points which project into the stream, are kept clearer of sediment and are supplied with a greater amount of food than their less fortunate fellows which are attached in the more sheltered places. To be brief:—the conditions about the oysters living on projecting points are the same, in effect, as were previously described for the vicinity of a reef. Figures 2, 3, 4 and 5 illustrate the idea of the effect of these conditions in producing, at first, a larger collection of clusters on the projecting points and then a linear growth of oysters toward the current channel. As this linear growth of oysters increases in length, it causes a gradual slowing down of the in-shore currents and a consequent reduction and final disappearance of the adjacent shore fringe of oysters.

Among the reefs of Newport River, as will be seen by reference to the chart which accompanies the paper, a branching is a very common phenomenon. The branching occurs sometimes at right angles to the main reef and sometimes giving the reef a "Y" shaped appearance. Such a branching as the latter would be' brought about by the reef having grown to the current channel and then having gradually pushed the current further into the river. Figures 5, 6 and 7. The current then no longer passing as a right angle to the long axis of the reef, the further attachment and growth of oysters in conforming to the same laws which governed the growth of the main reef would produce, at first, a wide ended reef and next a "Y." It will be easily seen from the series of figures given how other branches may be formed.

As the reef grows in length, its damming effect on the volume of water which must semi-daily find its way up and down the river increases, and there comes a time when the reef is no longer able to force the entire stream around its outer end. A break must occur at some point in the reef, and in nearly all the reefs the break occurs at a point not far from its shore origin.

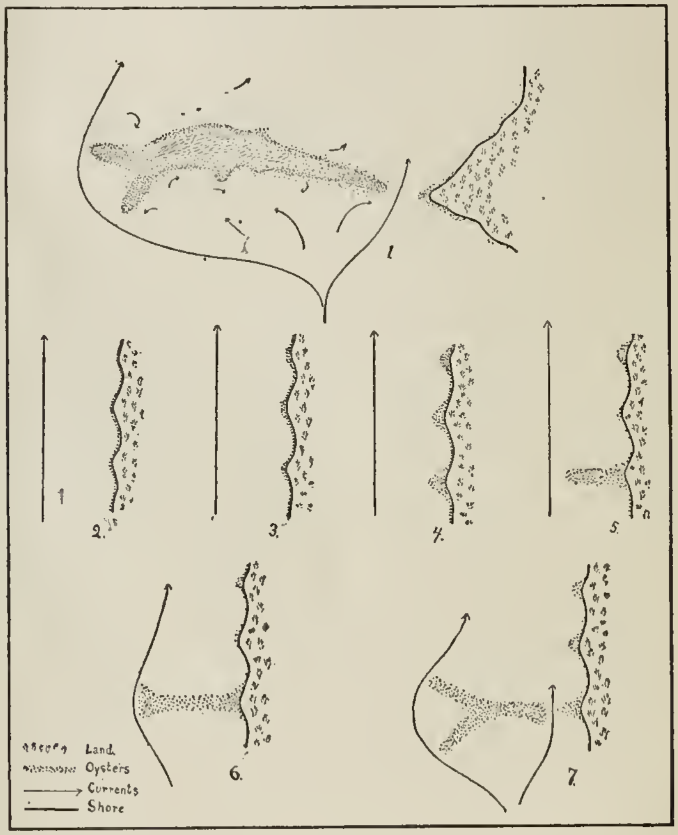


Figure 1. In some reefs more than one break exists, viz: Cross Rock.

Such is the development of a reef from a point on shore. A reef starting from a point in the river would, of course, grow at both ends and a break in its length would not be likely to occur, since two wide open ways are left through which the water can flow.

Reefs of recent formation are very narrow, and living clusters are found evenly distributed over their whole areas, for example: "A" reef at the head of the river.

As the reefs grow older and wider, however, the oysters in some places in the center become covered and killed by the sand, mud and shells which are washed up and deposited by the waves, for example: "Limekiln" reef.

As this debris accumulates year by year, the reef is gradually raised toward high-water mark. The successive catches of spat which spread over the top of the reef are repeatedly covered, until finally a plane is reached so near high-water mark that the period of time when the oysters are covered by water is too short to allow the minimum amount of food, which will support the life of an oyster, to be collected. Examples of such permanently dead reefs in Newport River are "Turtle" and "White" reefs.

On "Green" reef, opposite "Cross" reef, grass has gotten a start in one spot on one of its permanently dead areas.

The grassy islands in the lower part of the river, of which there are so many, are usually very low and marshy with only a fringe of living oysters surrounding them, but among them are a few small ones which, in addition to the living fringe of oysters, have a hard and shelly formation throughout, which character, together with their position in the river, probably betrays their origin from oyster reefs. The "Green" rock situated near the mouth of Core Creek, is an island which still retains unquestionable reef characters. Its age is no doubt very great, for its transformation from a reef to an island has been very slow and it is a landmark which has been used by more than one generation of fishermen. It is much protected from the action of waves by the long line of sand bars, which have formed below it. Were it placed in a less sheltered position, its now exposed shells would soon be covered and its width increased.

While a reef is low and its oysters living, its growth in length is much more rapid than its growth in width, but as soon as the oysters cease to thrive, its growth in length is stopped, and all further extension comes about through the action of waves which produces a growth in width only. In time, then, an island might be produced which would exhibit a width greater than the original length of the reef from which it started.

The bearing which these beds of oysters, thriving under natural conditions, have upon methods of oyster culture is obvious. They furnish a definite illustration of those conditions which are best adapted to securing a good set of young oysters, and, at the same time, insuring the best feeding conditions to the adults. A closer imitation on planted grounds of the conditions which are found on natural beds would have prevented many failures, and although this paper does not deal with this aspect of the question, I have thought it advisable to give a few of the conclusions which may be deduced from the study of oyster reefs as to methods of oyster planting. The ideas are not new, but they give a scientific basis to customs which have been in vogue for some time among the oystermen of the North. The Northern oystermen have found by experience that a better set is obtained on cultch which has been planted in rows across the currents which flow over them, than when scattered broadcast or planted in rows parallel to the currents.

The currents of water striking the rows of shells set across their channels are disturbed, and various swirls and eddies are produced which prevent the collection of sediment.

As the result of the study of oyster reefs, the following statements can be made concerning oyster planting:

Plant oysters in localities where good currents exist, and avoid, especially, sheltered areas where the currents are sluggish or where they do not exist.

Plant shells or other cultch in rows at right angles to the currents.

Plant on the elevated parts of the bottom, as they are likely to be freer from the deposit of sediment than the deeper areas.

Never plant oysters on a bottom of deep mud, unless previously made firm with shells or gravel. Even then such bottoms are to be regarded with suspicion, since the same conditions which brought about the original soft bottom may, in a short time, produce the same condition on the hardened areas.

REPORT OF A LECTURE BY DR. PUPIN, OF COLUMBIA UNIVERSITY, BEFORE THE SCIENTIFIC ASSOCIATION, ON NEW METHODS OF LONG DISTANCE TELEPHONY AND TELEGRAPHY.

By J. B. Whitehead, Jr.

The Scientific Association held its February meeting on the evening of the 13th, in McCoy Hall; a number of invitations had been extended to friends of the university and a large audience was present. Dr. M. I. Pupin, of Columbia University, delivered a most interesting lecture on his Recent Improvements in the Methods of Long-distance Telephony and Telegraphy. The difficulties which he has overcome are those due to self-induction and capacity, the most perverse and intangible quantities with which the electrical engineer has to deal, and his improvements are based on conclusions from advanced mathematical analysis. Notwithstanding these facts, however, Dr. Pupin by means of simple mechanical analogies, explained in a delightful manner not only the difficulties at present encountered, but also his methods for overcoming them.

If a string or cord is stretched between two points, energy may be transmitted from one point to the other by sending down the cord a series of waves. If the cord be light in weight, and the distance between the two ends increased, it will be found that after a certain length the waves will not reach the far end, and their amplitude will be less and less, proceeding from the sending end; the energy has been entirely absorbed within the body of the cord. If now a heavier cord of the same length be taken, and the same energy be given one end, it will be found that the waves will reach a more distant point than in the case of the lighter cord, and the heavier the cord, the farther will the waves be propagated.

Now if at regular intervals along the light cord balls of lead or other heavy material be placed, making the cord as heavy as the uniform heavier cord, and if the balls are not each one too heavy and so far apart, it will be found that the cord so loaded will be available for wave propagation to nearly the same distance reached in the case of the uniform heavy cord. If the balls are heavy and far apart, each will act as a reflector sending backward smaller waves which distort the natural smooth wave of the uniform cord; if, however, the number of balls is more than fifteen or sixteen to a wave-length, this disturbance is negligible. Another important property of a "loaded string" is that the attenuation of waves of all wave-lengths is practically the same, so that all waves go equal distances; whereas, in ordinary uniform string of light mass, the attenuation of short waves is much greater than that of long ones, and so the latter go further before dying down. This property of an ordinary string is called "distortion."

When a wave impulse is sent into a cord there are three reactions against it; that due to the mass or inertia of the cord; that due to the elastic properties of it; and that due to the internal friction within the body of the cord. The energy stored up in overcoming the first two of these reactions is not lost, but is returned again in making the impulse proceed along the wire, while that due to the third disappears as heat or is lost. So if the cord be constructed so that the mass and elastic properties are large compared with the frictional properties, a given impulse will reach a more distant point since there is less loss of energy. In the case of the two cords compared above the mass reaction was increased.

Now, in telephony and telegraphy, the energy is propagated along the wire in the form of waves of current, that is, a rising and falling of the strength of the current at various points along the wire. Dr. Pupin has shown that the electrical wave propagation obeys exactly the same laws as those regulating the vibrating string, if self-induction be considered as mass, capacity as the elastic reaction, and electrical resistance loss as the internal or frictional loss. Since the uniform heavy cord gives the best results, a wire with self-induction distributed uniformly along it should transmit electrical impulses farther than any other and with less distortion. For various reasons it is impossible to construct such a uniform wire; it is, however, perfectly possible to insert coils of self-induction at various points, and the performance of such a non-uniform conductor approaches closely that of the uniform conductor, as is indicated by the cords; the same relation, however, must hold between the wave-length and the spacing of the coils. The wave-length of telephonic impulses varies widely with the nature and construction of the line; eighteen miles is a short wave-length for a land line, so that one coil per mile will be enough to stop the distortion mentioned in the illustration of the loaded cord, the effect of which, in telephone waves, is to disturb the clearness of articulation received at the far end; this spacing of the coils will of course answer for all longer waves. Each coil for such a line would have a diameter of only five or six inches and be about the same number in length, so that each might easily be placed in an ordinary preserve jar.

It will thus be seen that, by the use of such coils, the limiting distance of telegraphy is tremendously increased and the service over shorter lines vastly improved. Dr. Pupin's investigation shows the number of coils and the value of each in self-induction or any given transmission line. The chief beauty of his work lies in the fact that he first made a complete mathematical analysis of the problem, then constructed an experimental line based on his conclusions, and finally carried out the series of tests which completely justified his conclusions, and which led to the purchase of his patents by one of the largest telephone companies in the country. Dr. Pupin is now working on an extension of his principle to the problem of submarine communication; the coils in this case must be nearer together, say six to the mile, but they will be smaller, and will be enclosed within the sheath of the cable.

A further advantage of the employment of these coils is that, when lightning strikes the line, the effect cannot proceed past a coil, since the waves corresponding to a lightning discharge are so short that the coil acts as a reflector to them.

Michael I. Pupin was born in Hungary in 1858. He ran away from school, came to America and worked his way into Columbia College, and graduated in 1883. He received the John Tyndall Scholarship, went to Cambridge University, and later to Berlin, where he studied physics under Helmholtz, taking the degree of Ph. D. in 1889. He then returned to Columbia, where he has been director of the department of electrical engineering. His appointment to the full professorship in Electro-Mechanics has just been announced.

ON THE REDUCTION OF THE DECIMIC TO SYLVESTER'S CANONICAL FORM.

By A. B. Coble.

In the reduction of the decimic binary form to the canonical form $u^{10}+v^{10}+w^{10}+y^{10}+z^{10}+\lambda uvwyz V$, where V is a covariant of the quintic $uvwyz$, the actual value of V has not been given. It may be found as follows:

$$\text{Let } uvwyz = ax^5+5bx^4y+5exy^4+fy^5.$$

making use of Hammond's canonical form.

$$\text{Let } V \equiv Ax^5+Bx^4y+Cx^3y^2+Dx^2y^3+Exy^4+Fy^5$$

Then V is such that

$$(ax^5+\ldots.) \text{ on } (ax^5+\ldots)(Ax^5+\ldots) \equiv \mu(ax^5+\ldots)$$

Performing the operation and equating coefficients we have six equations to determine $A, B, \ldots$

$$\begin{aligned}
&A(-30120af+72000be)+B(15720ae)\\
&\qquad +D(-3600b^2)+E(-120ab)+F(120a^2)=\mu a\\
&A(-78600bf)\ +B(-14400af+69000be)\\
&\qquad +C(20400ae)\qquad +E(-15000b^2)+F(600ab)=5\mu b\\
&\qquad B(-40800bf)+C(-4200af+27000be)\\
&\qquad\qquad +D(25200ae)\qquad +F(-36000b^2)=0\\
&A(36000e^2)\ +C(-25200bf)+D(4200af-27000be)\\
&\qquad\qquad\qquad +E(40800ae)\qquad =0\\
&A(-600ef)\ +B(15000e^2)\qquad +D(-20400bf)\\
&\qquad +E(14400af-69000be)+F(78600ae)=5\mu e\\
&A(-120f^2)\ +B(120ef)+C(3600e^2)\\
&\qquad +E(-15720bf)+F(30120af-72000be)=\mu f
\end{aligned}$$

Hence to a factor $\frac{\mu\rho}{\Delta}$ where ρ is a number and Δ the determinant of the system, we have that

$$A=\begin{vmatrix}
a & 13ae & 0 & -6b^2 & 0 & 0\\
5b & -12af+57be & 34ae & 0 & 12b^2 & 0\\
0 & -34bf & -7af+45be & 42ae & 0 & -6b^2\\
0 & 0 & -42bf & 7af-45be & 34ae & 0\\
5e & 12e^2 & 0 & -34bf & 12af-57be & 13ae\\
f & 0 & 6e^2 & 0 & -13bf & 5af-12be
\end{vmatrix}$$

Evidently then V is a covariant of degorder 11,5. The quintic possesses ten such covariants connected by four syzygies. The following chosen six are independent, and the problem is to express V in terms of them.

$$\text{Let } V=\lambda_1 C_{93}C_{22}+\lambda_2 C_{35}C_{80}+\lambda_3 C_{35}C^2_{40}+\lambda_4 C_{71}C^2_{22}+\lambda_5 C_{75}C_{40}$$
$$+\lambda_6 C_{40}C_{22}C_{53}$$

These λ_s may be identified, of course, by comparison of the leading terms only, *i. e.* A with the leading terms of the six covariants. These leading terms for Hammond's form are given by Elliott (Algebra of Quantics).

Now in A put $a=0$ with the same substitution in the leading terms on the right hand side of the above identity and we obtain

$$\lambda_5 = -84.\ 45.\ 21.\ 16.$$

Similarly putting $b=0$, we have $-2\lambda_2+3\lambda_4=34.\ 42.\ 42.\ 100$ and

$$\lambda_3 = 5.\ 12.\ 12.\ 7.\ 7.$$

Similarly putting $e=0$, we have again $\lambda_3=5.\ 12.\ 12.\ 7.\ 7$, and $\lambda_2+\lambda_5=-84.\ 5.\ 12.\ 7.\ 11.$ Hence

$$\lambda_2 = 84.\ 7.\ 12.\ 5.\ 25, \text{ and}$$
$$\lambda_4 = 84.\ 7.\ 100.\ 44.$$

To obtain λ_1 and λ_6 most easily use the terms in x^4y in the above identity. This requires the writing down and simplification of a similar determinant for B, care being taken that the same numerical factors are removed as for A.

In B put $e=0$ and we have $\lambda_3=5.\ 12.\ 12.\ 7.\ 7$, as before, and $2\lambda_1-10\lambda_2=5.\ 7.\ 12.\ 12.\ 6.\ 175.$ Hence

$$\lambda_1 = 84.\ 5.\ 12.\ 7.\ 50.\ 4.$$

In B put $b=0$, and we get $7\lambda_4 + 2\lambda_5 + 4\lambda_6 = 5.\ 34.\ 42.\ 5.\ 12.\ 28.$

Hence $\lambda_6 = -84.\ 5.\ 28.\ 4.\ 19.$

Verifications of these values are found by putting in A, $f=0$; in B, $a=0$ and $f=0$.

Removing another numerical factor from the λ's we have finally that $\lambda_1 = 600$, $\lambda_2 = 75$, $\lambda_3 = 3$, $\lambda_4 = 220$, $\lambda_5 = -108$, $\lambda_6 = -76$.

$$\therefore V = 600 C_{22} C_{93} + 75 C_{35} C_{80} + 3 C_{35} C^2_{40} + 220 C_{71} C^2_{22} - 108 C_{75} C_{40} - 76 C_{40} C_{22} C_{53}.$$

From the following syzygy,

$$3 C_{71} C_{44} = 5 C_{71} C^2_{22} - 5 C_{40} C_{22} C_{53} + 24 C_{22} C_{93} + 3 C_{35} C_{80} - 6 C_{75} C_{40},$$

we can eliminate the first two terms of V and we have finally

$$V = 75 C_{71} C_{44} + 3 C_{35} C^2_{40} + 95 C_{71} C^2_{22} + 49 C_{40} C_{22} C_{53} + 42 C_{75} C_{40}.$$

Thus, the general impression left by some text-books (Elliott and Salmon)—that there are inherent difficulties connected with the reduction to Sylvester's form and that, the reduction effected, the form would be useful—is in both respects seen to be misleading.

Dec. 19, 1900.

PUBLIC MEETINGS RECENTLY HELD IN THE UNIVERSITY BUILDINGS.

Reception tendered by the Young Men's Christian Association of the University to the students recently admitted, in Levering Hall, October 1.

Address by President Gilman and an informal reception of the officers and students on the occasion of the opening of the twenty-fifth academic year,—in McCoy Hall, October 12.

Commemoration of the fiftieth birthday of Robert Louis Stevenson, in the President's office, November 13.

Annual meeting of the Baltimore Society of the Archæological Institute of America, in the President's office, November 14.

Meeting of the Maryland Folk-Lore Society, in the Donovan Room, November 23, March 1, March 29.

Annual public meeting of the Charity Organization Society of Baltimore, in McCoy Hall, November 27.

Third annual Teachers' Institute of Baltimore County, in McCoy and Levering Halls, December 17–21.

Annual meeting of the American Society of Naturalists and the affiliated societies, in McCoy and Levering Halls, the Physical Laboratory, and the Medical School buildings, December 27 and 28, with a reception tendered by the University in McCoy Hall, December 27.

Annual meeting of the Municipal Art Society of Baltimore, with an address by the President of the Society, Dr. Gilman, and an illustrated lecture by Mr. C. Howard Walker, of Boston, on the Improvement of Cities, in McCoy Hall, January 9.

Lectures, under the auspices of the Archæological Institute of America, by Professor Louis Dyer, of Oxford University, in McCoy Hall, January 8, 9, 10; by Mr. H. C. Butler, of Princeton University, January 18; by Professor S. B. Platner, of Western Reserve University, February 1; by Professor M. L. D'Ooge, of the University of Michigan, March 8.

A lecture, under the auspices of the University Scientific Association, by Professor M. I. Pupin, of Columbia University, on Recent Improvements in Long Distance Telephony and Telegraphy,—in McCoy Hall, February 13.

The annual public debate between members of the Senior and Junior Classes, with public speaking by Freshmen, in McCoy Hall, March 21.

Concert by the Musical Clubs of the University, for the benefit of the athletic grounds, in McCoy Hall, March 26.

Annual meeting of the Maryland State Federation of Women's Clubs, in Levering Hall, March 27 and 28.

PERCY TURNBULL MEMORIAL LECTURESHIP.

A lectureship to treat of Poetry has been instituted in this University by the generosity of Mr. and Mrs. Lawrence Turnbull, of Baltimore, who thus commemorate the name of their son, Percy Graeme Turnbull, who died in 1887.

In accordance with the terms of the gift, a course of lectures may be expected annually from some one who has gained distinction as a writer of poetry or as a critical student of the poetic art.

The Trustees have the pleasure of announcing that the ninth course of lectures on this foundation will be given by Hamilton W. Mabie, Litt. D., editor of the "Outlook," and author of the following works: "William Shakespeare: Poet, Dramatist, and Man"; several volumes of essays treating of Culture and of Literary Interpretation; "My Study Fire"; "Under the Trees and Elsewhere"; "Short Studies in Literature"; "Norse Stories retold from the Eddas," etc.

The subject of the course will be *Poetry in America.*

The lectures will be given in McCoy Hall, at 5 o'clock, beginning Tuesday, April 16, 1901.

TOPICS.

Tuesday, April 16.	The Making of the Poem.
Wednesday, April 17.	The Poetry of New England.
Thursday, April 18.	Edgar Allan Poe.
Monday, April 22.	The Poetry of the South.
Tuesday, April 23.	The Middle Period.
Wednesday, April 24.	The Poetry of To-day.
Thursday, April 25.	Significance of American Poetry.

LECTURERS ON THIS FOUNDATION.

1891. Edmund C. Stedman, LL. D., of New York,—"The Nature and Elements of Poetry."

1892. Professor Richard C. Jebb, LL. D., D. C. L., of the University of Cambridge,—"The Growth and Influence of Classical Greek Poetry."

1893. Professor Robert Y. Tyrrell, LL. D., Litt. D., of Trinity College, Dublin,—"The Growth and Influence of Latin Poetry."

1894. Professor Charles Eliot Norton, LL. D., D. C. L., of Harvard University,—"Dante."

1896. Professor George Adam Smith, D. D., of the Free Church College, Glasgow,—"Hebrew Poetry."

1897. M. Ferdinand Brunetière, Editor of the "Revue des Deux Mondes."—"French Poetry."

1898. Professor Charles R. Lanman, Ph. D., of Harvard University,—"The Poetry of India."

1900. Professor Charles H. Herford, Litt. D., of the University College of Wales,—"English Poetry."

1901. Hamilton W. Mabie, Litt. D., Editor of "The Outlook,"—"Poetry in America."

STUDIES IN TYPHOID FEVER.

SERIES I-II-III.

The papers on Typhoid Fever, edited by Professor William Osler, M. D., and printed in Volumes IV, V and VIII of The Johns Hopkins Hospital Reports have been brought together, and bound in cloth.

This volume includes thirty-five papers by Doctors Osler, Thayer, Hewetson, Blumer, Flexner, Reed, Parsons, Finney, Cushing, Lyon, Mitchell, Hamburger, Dobbin, Camac, Gwyn, Emerson and Young. It contains 776 pages, large octavo, with illustrations. It gives an analysis and study of the cases of Typhoid Fever in the Johns Hopkins Hospital for the past ten years.

The price is $5.00 per copy. Only a few copies of the volume are on sale. Those wishing to purchase should address their orders to the Johns Hopkins Press, Baltimore, Maryland.

PUBLICATIONS OF THE INSTRUCTORS AND GRADUATES OF THE JOHNS HOPKINS MEDICAL SCHOOL FOR THE YEARS 1899 AND 1900.

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On the teaching of pharmacology, materia medica, and therapeutics in our medical schools.—*Phila. Medical Journal*, Sept. 1900.

Mabel F. Austin. Endocarditis due to a minute organism, probably the bacillus influenza.—*The Johns Hopkins Hospital Reports*, Vol. IX. (See also W. H. Howell.)

William S. Baer, Percy M. Dawson, and Harry T. Marshall. Regeneration of the dorsal root fibres of the second cervical nerve within the spinal cord.—*Journal of Experimental Medicine*, January, 1899.

Charles R. Bardeen. Scientific work in public institutions for the care of the insane.—*American Journal of Insanity*, LV, 1899.

Outline record charts used in the anatomical laboratory of the Johns Hopkins University.—*The Johns Hopkins Press.*

The development of the musculature of the body wall in the pig, including its histogenesis and its relations to the myotomes and to the skeletal and nervous apparatus.—*The Johns Hopkins Hospital Reports*, Vol. IX.

Costo-vertebral variation in man.—*Anat. Anz.*, XVIII, 1900.

Lewellys F. Barker. A case of glioma of the lower cervical region of the spinal cord producing a total transverse lesion, in which there was spasticity of the lower limbs and persistence of the deep reflexes. A study of a peculiar form of degeneration (degeneratio micans) met with in this case.—*American Journal of the Medical Sciences*, Vol. 117.

On the microscopic alterations met with in the tissues from a case of chronic diffuse nephritis, terminating with symptoms of Landry's paralysis.—*The Johns Hopkins Hospital Reports*, Vol. IX.

Progress of neurology.—*Philadelphia Medical Journal*, January 28 and February 4, 1899.

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Transitory alienation following distressing pain.—*Ibid.*

A treatise on mental diseases. Pp. 624.—*D. Appleton & Co.*, 1900.

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John M. Berry. On the development of the villi of the human intestines.—*Anat. Anz.*, XVII.

Joseph C. Bloodgood. Early exploratory operations in tuberculosis of the hip.—*The Johns Hopkins Hospital Bulletin*, January, 1900.

George Blumer. Infectious character of tuberculosis and prognosis of incipient pulmonary consumption.—*Albany Med. Annals*, April, 1900.

William K. Brooks. Scientific laboratories.—*The Johns Hopkins Hospital Bulletin*, November, 1899.

Thomas R. Brown. On the chemistry, toxicology and therapy of snake poisoning.—*The Johns Hopkins Hospital Bulletin*, December, 1899.

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Patrick Cassidy. Report of a severe x-ray injury.—*Medical Record*, Feb. 3, 1900.

John G. Clark. The origin, development and degeneration of the blood-vessels of the human ovary.—*The Johns Hopkins Hospital Reports*, Vol. IX.

Henry C. Coe. Pain as a pathognomonic symptom of ectopic pregnancy.—*Medical News*, April 21, 1900.

Thomas S. Cullen. Cancer of the uterus. Its pathology, symptomatology, diagnosis and treatment; also the pathology of diseases of the endometrium.—*D. Appleton & Co.*, New York, 1900.

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EMIL HÜBNER,

July 7, 1834—February 21, 1901.

The sudden death of Emil Hübner, Professor of Classical Philology in the University of Berlin, has brought personal sorrow to many American scholars, to none more poignant grief than to the writer of this tribute to a friendship which had lasted unbroken and unclouded for nearly fifty years. No scholar ever had more friends, none deserved them better. In Italy, where he studied in his young manhood, in Spain and Portugal, where he sojourned for a long time while making his epigraphical collections, in England, which he visited for the like purpose, he was as well known as he was in Germany; and though he declined a pressing invitation to the Chicago Exposition in 1893, there are Americans enough who have shared his generous hospitality at his charming house in Berlin to join those who are mourning the loss of a man whose winning personality and ready sympathy, moral and intellectual, gave a human interest to his encyclopaedic learning. Born on the seventh of July, 1834, the son of an eminent painter of the Düsseldorf school, Julius Hübner, and the nephew of another great artist, Edward Bendemann, he belonged to a family of rare culture in art and letters; and his receptive nature blossomed into early maturity. He was only twenty years old when he received his Doctor's degree at the University of Bonn, where Ritschl determined his course of life, and thenceforth his career was one of rapid advancement. His chief line of work was Latin epigraphy, in which he rose to eminence as a collaborator in the Berlin Corpus, as a master of all the varieties of inscriptional forms. Most of his published works are in this line, but he was also a special student of Greek and Latin grammar, as is evinced by his extremely valuable bibliographical manuals on these subjects; and his wide range of interest is shown not only by his 'Grundrisse zu Vorlesungen über die Geschichte und Encyklopädie der klassischen Philologie,' but by numerous contributions to German periodicals such as the 'Deutsche Rundschau' and the 'Deutsche Litteraturzeitung.' He was at home in many languages and had a keen appreciation of the recent productions of the English and American press. It is not everyone who can turn from writing a searching review of a work on the Keltic element in Latin to inditing a sympathetic notice of Ian Maclaren's 'Country Doctor.' What he was to me personally, as the comrade of my youth, as the link that bound me to the period of revelation and aspiration, as the constant, generous friend of riper years, I will not trust myself to say. 'Ueber alles Glück geht doch der Freund, Der 's fühlend erst erschafft, der 's theilend mehrt.' But I cannot close this imperfect notice without some reference to the work which Hübner did for the Johns Hopkins University. It will be remembered that in 1888–9 the Latin Department, owing to the protracted illness of Professor Warren, was without a head, and at my instance the authorities had recourse to Professor Hübner, who prepared a valuable bibliography of Cicero's Letters, with hints for study (*J. H. U. Circulars*, No. 72), which served to bridge over the chasm; and the reports on the dissertations submitted to his judgment were remarkable for their fulness, their conscientiousness, their discrimination.

Hübner died suddenly, as his younger brother, the successor of Wöhler at Göttingen, had died, called away from the fulness of an active and vigorous life. He was spared the pitifulness of slow senescence. He was alert to the end, such an end as he would doubtless have wished for himself. True, he had a great work on the stocks, a work which was to crown his life, but work unfinished is also a bequest.

When his highly gifted wife died, he had carved on her tomb a line from her father's translation of Aeschylus, 'Du bist vollbracht, Nachtwache meines Lebens.' It is a good epitaph for a scholar that watches on the outposts of scientific life. It is far better than the sigh which one hears from Heyne's Vergilian inscription, 'Vixi et quem dederat cursum Fortuna peregi.' But even Droysen could not rival the terseness of the Greek original. There are but two words, *Διαπεφρούρηται βίος*.

B. L. G.

BENJAMIN F. NEWCOMER.

At a meeting of the Trustees of the Johns Hopkins University, held April 1, 1901, the death of Mr. B. F. Newcomer was announced, and a committee was appointed to prepare a suitable minute. They reported the following minute, which was adopted by the Trustees, and it was ordered that it be entered on the records of the Board and that a copy be sent to the family of Mr. Newcomer.

Seven years ago, April 2, 1894, Mr. Benjamin F. Newcomer was elected a Trustee of the Johns Hopkins University. In inviting him to become a member of this Board, the Trustees were well aware that he was one of the most responsible men of this community, trusted in all the walks of life, and they also knew him as one of the busiest. It was, therefore, a great encouragement to them when he consented to become their colleague, and to take an active part in the affairs of the university as a Trustee and as a member of the Finance Committee, and for a short period as a member of the Executive Committee.

His quick and clear comprehension of difficult problems was not less remarkable than the soundness of his judgment and the wisdom of his counsel. His words were few, but they were frank and conclusive, and many are they who profited by his advice.

He took pains to conceal his liberality, so that few of his fellow-citizens are aware of the promptness, the friendliness, and the extent of his contributions to public institutions. To the Maryland School for the Blind, of which he was the President, to the Friendly Inn, in which he took a personal interest, to the Mercantile Library, of which he had been an early member, to the Association for Improving the Condition of the Poor, to the Home for Consumptives, and to the public library in Hagerstown, he gave freely and proportionately. Twice he made liberal subscriptions for the maintenance of this university, and he had indicated his willingness to make a much larger contribution toward the proposed endowment.

The Johns Hopkins University will not forget the friend, the adviser, and the benefactor, who has rendered such varied services to this institution and to the community upon which it depends for support. He will be remembered as a man devoted to business who found the time and showed the disposition to advance the education and the charities of this community by his gifts, by his sympathies, by his suggestions, and by his influence.

JULIAN HUGUENIN.

Dr. Julian Huguenin died in Atlanta, Ga., February 19, 1901. He was a native of South Carolina and a graduate of the College of Charleston in 1895 as a Bachelor of Arts. In the following October he entered the Johns Hopkins University as a student of English, holding a university scholarship in 1897–98 and a fellowship in 1899–1900. In June last he received the degree of Doctor of Philosophy. Since last September he had been in charge of the department of English in the University of Louisiana, in the absence of the head of that department.

A meeting of the professors and students of English in this University was held February 27, and the following minute was adopted:

> The English Seminary of the Johns Hopkins University has assembled for the purpose of recording its sorrow on learning of the death of its recent member, Mr. Julien Huguenin.
>
> Dr. Huguenin entered the department in the fall of 1895 and for five years was a constant attendant upon all exercises. From the first he was distinguished for his zeal and enthusiasm, and during the entire period his work was characterized by originality, by thoroughness and by clearness of presentation. He deservedly held the scholarship and the fellowship in the department. In June, 1900, he received the degree of Ph. D. He left the University to enter upon his life-work as a college professor, and became at once recognized as a scholar of promise. We regret the death of one who, by his enthusiasm and attainments, would have accomplished much in his chosen department of knowledge.
>
> Above all, we lament the death of the courteous comrade, whose refinement of manner and gentleness of spirit had endeared him to us all. He was always generous of his time and knowledge to those who sought his aid. By those who knew him intimately he will be remembered as the attractive, cheerful and sympathetic companion, and as the specially beloved friend.
>
> We now feel not only our own sorrow, but also our deepest sympathy for his mother and sisters.
>
> Be it resolved, therefore, That the record of this meeting be placed upon the minutes of the English Seminary and that a copy be sent to the family of Dr. Huguenin.

THEODORE C. SCHNEIDER.

The Physical Laboratory suffered a severe loss in the death of Mr. Theodore C. Schneider on February 12, 1901, in the fifty-fourth year of his age. Mr. Schneider had occupied the position of Mechanician to the laboratory ever since the founding of the University, having been called to this position by Professor Rowland in 1875. Previous to this he had been employed at the Gurley Machine Shops, Troy, N. Y., and while there had done considerable work for Professor Rowland.

Under Professor Rowland's personal supervision, he constructed the three machines used for ruling the spectrum gratings made at this laboratory and used in all parts of the world where exact measurements in spectroscopy are attempted; and for several years he has had exclusive charge of selecting and of adjusting the diamond points to the machine, and of ruling the gratings. The construction of these ruling machines involved the grinding of screws a foot or more in length, which should be as perfect as possible throughout their lengths. Mr. Schneider ground four of these screws which under the most severe tests to which they can be put have as yet shown no appreciable error. They are without doubt the most perfect screws in the world.

LECTURES ON HISTORICAL SUBJECTS RECENTLY GIVEN IN THIS UNIVERSITY.

United States History, 1836–1861.

Dr. Frederick Bancroft, of Washington, author of a "Life of William H. Seward," etc., twelve lectures on *United States History during the period from* 1836 *to* 1861, Mondays and Tuesdays, February 10 to March 19.

Millenary of King Alfred.

Mr. Frederic Harrison, of London, England, two lectures, March 6 and 7, on the *Millenary of King Alfred and the Writings of King Alfred.*

International Questions.

Professor John Bassett Moore, LL. D., of Columbia University, formerly Assistant Secretary of State and later Secretary to the Peace Commission at Paris, two lectures on international questions, March 19 and 21, his topics being *Our Treaty with Spain* and *Our Policy in the Far East.*

The Founders of the Republic.

Professor James Schouler, LL. D., of Boston, author of a "History of the United States under the Constitution," four biographical lectures, in continuation of his course begun last year, on the great Founders of the American Republic, March 20, 22, 27, 29, his topics being as follows: *John and Samuel Adams; James Madison; John Jay and John Marshall; James Monroe.*

Modern Colonization.

Poultney Bigelow, Esq., of New York, two lectures on the Establishment and Treatment of Colonies, March 28, 30, treating these topics: *Latin Colonization* and *Dutch Colonization.*

United States History, 1816–1835.

Professor David F. Houston, of the University of Texas, two lectures on the period from 1816 to 1835, "touching upon the reorganization of the commercial policy, the protest of the minority, and the nullification movement as a test of the Union—its origin, nature, and significance," April 11 and 12.

Petrarch.

Professor James H. Robinson, of Columbia University, two lectures, May 3 and 6: *Petrarch and his fellow scholars; Petrarch and himself as seen in his "Confessions."*

The Annual Catalogue (for 1900–1901) and Announcement (for 1901–1902) of the Medical Department of the University is now ready. Copies may be had on application to the Registrar of the Johns Hopkins Medical School, Baltimore.

The Annual Register of the University is in press and will be issued in May. The Announcements for the next year will be issued in June as usual.

Copies of the Register and Announcements may be had from the Registrar of the Johns Hopkins University, Baltimore.

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